SECTION 602

PORTLAND CEMENT CONCRETE FOR CHANNEL LINING AND DIKE OR DAM SURFACING

602.1 GENERAL

This section governs the construction of Portland Cement Concrete for channel lining, or surfaces of dikes or dams on a prepared subgrade in substantial compliance with the lines, grades, thickness, and typical cross-sections shown on the plans or established by the ENGINEER.

602.2 REFERENCES

602.2.1 American Society for Testing and Materials (Latest Editions)(ASTM)

C-33 Specification for Concrete Aggregates

602.2.2 This Publication:
Section 101 Portland Cement Concrete
Section 102 Steel reinforcement
Section 105 Concrete curing Compound
Section 107 Joint Filler and Sealant Material
Section 349 Concrete Curing

602.3 MATERIALS

602.3.1 The cement, water, fly ash, and admixtures used in the concrete work constructed under this section shall conform to the requirements of Section 101 or as modified by the plans and/or the Supplemental Technical Specifications and the approved concrete mix design(s).

602.3.2 Aggregates shall meet the requirements of ASTM C-33 and shall conform to the grading for Size Number 467, as per Table 2 of ASTM C-33.

602.3.3 Steel reinforcement used in the concrete constructed under this section shall conform to the requirements of Section 102 or as modified by the plans and/or the Supplemental Technical Specifications and the approved shop drawings of the steel reinforcement.

602.3.4 Expansion joint material, fillers and sealants used in the concrete constructed under this section shall conform to the requirements of Section 107 or as modified by the plans and/or the Supplemental Technical Specifications and the approved shop drawings, if required.

602.3.5 Liquid membrane-forming compounds for curing concrete if used on the concrete constructed under this section shall conform to the requirements of Section 105 or as modified by the plans and/or Supplemental Technical Specifications.

602.4 STEEL REINFORCEMENT

The steel reinforcement size and spacing shall be as shown on the construction plans. Concrete blocks or steel chairs shall be used to provide the requirement minimum clearance of 3" between the subgrade and the steel.

602.5 CONCRETE JOINTS

602.5.1 Expansion, contraction, and/or construction joint spacing and details shall be as shown on the construction plans.

602.5.2 Where joints are formed, preformed polyethylene zip-strip forms shall be used. The joint shall be completed while the concrete is plastic where the construction joints are allowed with preformed metal forms to remain in place, no bonding agent will be used, and the edging tool shall have a 1/4 inch radius. This type of joint will be allowed above nuisance flow elevations only.

602.5.3 Where saw cutting is allowed or required, it shall be done with a wheel mounted saw, except where hand held saw is required to complete the saw cuts at plane intersections.

602.5.4 Where saw cutting is required to re-size or straighten sealant nosing, it shall be done with a wheel mounted double bladed saw so that the nosing faces are uniformly spaced, vertical and true, or with a track mounted adjustable arbor saw so that the two nosing cuts will achieve the same results as a double bladed saw. Hand held saws will be allowed for joining the cuts at plane intersections where the mounted saws cannot reach.

602.5.5 All joints to be sawed shall be sawed before uncontrolled shrinkage cracking takes place. If necessary, the sawing operations shall be carried on both during the day and night, regardless of weather conditions. The sawing of any joint shall be omitted if a crack occurs at or near the joint location prior to the time of sawing. Sawing shall be discontinued when a crack develops ahead of the saw. In general, all joints shall be sawed in sequence. If extreme conditions exist which make it impractical to prevent erratic cracking by early sawing, the contraction joint groove shall be formed prior to initial set of concrete. Contraction joints shall be formed or sawed to one-fourth the depth of the concrete lining.

602.5.6 At end of concrete placement construction joints shall have a 12 inch thickened edge or as shown on plans. Said joints shall be formed with continuous steel through the forms, and the forms shall be removed before the concrete placement is continued. When the forms are removed, the previously placed concrete shall be sandblasted to remove oil and wax and a fresh concrete epoxy bonder applied immediately before fresh concrete is placed against it. This joints shall be edged with

a 1/8 inch maximum radius tool.

602.6 PLACEMENT, CONSOLIDATION, AND FINISHING OF CONCRETE

602.6.1 The thickness of the concrete lining shall be as specified on the construction plans.

602.6.2 The ENGINEER shall approve the CONTRACTOR'S proposed method of placing and consolidating the fresh concrete. The use of a canal or slope paving machine is encouraged. Such machine must meet the following conditions:

602.6.2.1 It shall be of the type having rollers and augers and shall also have vibrating pans, or spud-type vibrators capable of vibrating at 3500 impulses per minute.

602.6.2.2 The machine shall be in good repair and properly maintained. Fuel tanks must be full before placing concrete, and should be of sufficient capacity to preclude refueling during concrete placement.

602.6.2.3 Rails must be strong enough and sufficiently anchored to prevent flexing or bending when the machine is operated. Rails must be kept clean during paving operations.

602.6.3 Slope paving machine operation shall include the following procedures:

602.6.3.1 Follow manufacturer's guidance regarding set-up and operation.

602.6.3.2 A dry run shall be made before concrete is placed to check grades and lines and proper operation.

602.6.3.3 Only authorized operator(s) will be allowed on the machine while in operation.

602.6.3.4 Augers shall be adjusted up or down to maintain a roll of concrete one inch high on the front or leading end of the finishing rollers.

602.6.3.5 The rear of the machine should be raised slightly (about 1/8 inch) to allow grout on the side of the finishing rollers to feather itself out and leave a smooth finish.

602.6.3.6 The machine shall be advanced such that all concrete receives at least three passes of the rollers.

602.6.4 Concrete placement shall include the following techniques:

602.6.4.1 A concrete pump or other ENGINEER approved method shall be used to place the concrete. Provision shall be made for a backup unit. Concrete samples for slump tests shall be taken at the pump outlet.

602.6.4.2 Concrete shall be placed close to the final position, and to its full thickness.

602.6.4.3 Do not place concrete more than 12 feet in front of the machine.

602.6.4.4 The height of the concrete roll in front of the augers shall be at least one-half the diameter of the auger.

602.6.5 Finishing of the concrete shall be accomplished with a magnesium or aluminum float followed by a medium broom. The surface shall be finished to a plane having no variation in excess of 1/4 of an inch when measured with a 10 foot straightedge, including joints to existing, adjacent concrete surfaces, unless a curved surface is specified.

602.7 CURING

602.7.1 Immediately after the finishing operations have been completed the CONTRACTOR shall initiate the curing of the concrete as specified in Section 349 and/or as approved by the ENGINEER.

602.8 PROTECTION FROM DRAINAGE FLOWS

602.8.1 The CONTRACTOR shall take all necessary precautions to assure that no damage to new work or the existing channels in work areas is caused either by flood waters, well wash water or other drainage. Suggested precautions include scheduling work in conjunction with favorable weather forecasts and by coordinating work with the Public Works Dept., Water Systems Division, 5501 Pino N.E..

602.8.2 Adequate control of water channeling and pumping shall be done to prevent damage to existing or new channel lining. Concrete lining damaged by water action shall be removed and replaced by the CONTRACTOR at the CONTRACTOR'S expense. The CONTRACTOR will hold the OWNER harmless for any damage to materials, equipment or manpower caused by flooding.

602.9 REPAIR AND REPLACEMENT OF CONCRETE LINING

602.9.1 Work that is found to be defective or damaged prior to acceptance, or existing lining damaged by the CONTRACTOR'S operations shall be replaced by the CONTRACTOR at no expense to the OWNER.

602.9.2 The Portland cement concrete to be used for repair shall conform to Section 101.

602.10 TOLERANCE IN PAVEMENT THICKNESS

602.10.1 Acceptance of the finished channel lining with respect to thickness shall be on the basis of random core sampling, as designated by the ENGINEER. A minimum of two core samples will be taken from longitudinal lengths of channel not to exceed 500 linear feet, or from a one day's

placement of concrete not to exceed 500 linear feet. If deficiencies are noted, the ENGINEER may require additional core samples to be taken. All coring required by the ENGINEER shall be at the OWNER'S expense.

602.10.2 Should the CONTRACTOR desire to have additional core samples taken these samples would be taken at the CONTRACTOR'S expense.

602.10.3 Deduction for a deficiency in thickness shall be made according to Table 602.10.3. Thickness deficiency shall be based on the average thickness of the number of samples taken within the specified length of channel.

602.10.4 It shall be the responsibility of the person requesting the core sampling to have the core holes immediately filled with fresh concrete. This concrete shall be of the same concrete mix and of equal compressive strength as the original concrete.

602.10.5 Any concrete lining that is noted to be deficient in thickness at or more than the reject level on Table 602.10.3 shall be removed and replaced at the CONTRACTOR'S expense.

602.10.6 For information purposes only, the ENGINEER may have the core samples tested for compressive strength.

602.11 STRENGTH TEST REQUIREMENTS

602.11.1 Concrete for channel lining shall be designed for a minimum compressive strength as specified in Section 101 or as modified in the Supplemental Technical Specifications and the approved concrete mix design(s).

602.11.2 The CONTRACTOR shall furnish the concrete for casting cylinders. Unless otherwise specified, four (4) cylinders shall be made for each 100 cubic yards of concrete placed. The ENGINEER or an independent testing laboratory designated by the ENGINEER shall fabricate and test specimens. Sampling and testing of smaller quantities of concrete used in minor channel work will be done as required by the ENGINEER. Results of all tests shall be reported to the ENGINEER, CONTRACTOR, SUPPLIER, AND OWNER.

602.11.3 Casting, curing, and testing of concrete cylinders shall comply with the requirements in Section 101.

602.12 MEASUREMENT AND PAYMENT

602.12.1 MEASUREMENT: Concrete lining or surfacing shall be measured by the square foot, as measured along the finished surface for the type and thickness stated on the construction plans.

602.12.2 PAYMENT: The payment for concrete lining or surfacing shall be at the contract unit price per square foot per type and thickness complete in place, which price shall include all material, equipment and labor required in the subgrade finishing, placement of the reinforcement steel, forming, placement of the concrete, finishing, curing, form removal, backfilling, and cleanup.

TABLE 602.10.3

DEDUCTIONS FOR DEFICIENCY IN THICKNESS
(Average thickness per core measured in accordance with ASTM C 174)

Thickness Deficiency	Percentage of Contract Price Allowed 6"*	7"*	8"*
0 to 1/4"	100	100	100
Greater than 1/4" to 1/2"	90	92	94
Greater than 1/2" to 3/4"	Reject	84	88
Greater than 3/4" to 1"		Reject	82
Greater than 1"			Reject

*Design Thickness